Columbia River Redband Trout Species Account

Prepared for

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Montana DNRC Forested Trust Land HCP Species Account

The enclosed "species account" was prepared to provide background information used for the development of the Montana DNRC Forested Trust Lands HCP. Species accounts identify the best available science for each species. Species accounts were reviewed by DNRC and USFWS when negotiating the HCP conservation strategies to ensure that these strategies would be biologically and technically sound and that the strategies would be advantageous to species conservation. The species accounts will also used to prepare chapter sections of the HCP and EIS. Use of species account information for the HCP was particularly important when (1) selecting where the HCP conservation strategies would be of maximum benefit for the HCP species on DNRC lands [i.e, project area], (2) selecting computer models in predicting how the existing DNRC management actions and the proposed alternatives affect each HCP species, (3) determining how existing DNRC monitoring and adaptive manage programs can be used to support the HCP, and (4) developing rationale for species conservation strategies. Species account information will be used in the EIS for preparing the affected environment section for each HCP species and for describing how existing DNRC harvest practices and associated road construction affect HCP species.

Species account information was acquired by reviewing recent relevant publications and contacting key experts in Montana and the intermountain states that were knowledgeable about recent unpublished research for each species. Species agency listing status and species distribution in Montana were also reviewed. Maps are included that provide approximate known distribution for each species.

The species account descriptions also provide information about the existing protective measures that are required by federal and state laws and regulations or were agreed to by DNRC through conservation or related agreements. Other information contained in the species accounts includes additional conservation measures developed by other agencies or HCP applicants and existing DNRC monitoring and research programs. Finally, references are provided for the background information acquired for each species.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

ARM	Administrative Rules of Montana
BMP	best management practices
C	Celsius
CMZ	channel migrations zones
dbh	diameter at breast height
DNRC	Department of Natural Resources and Conservation
EA	environmental assessment
EDT	ecosystem diagnosis and treatment
ft	feet
ft/s	foot per second
FR	Federal Register
GMRD	geometric mean road density
HCP	habitat conservation plan
in	inch
INFISH	Inland Native Fish Strategy
LWD	large woody debris
MCA	Montana Code Annotated
MFWP	Montana Fish, Wildlife, and Parks
MNHP	Montana Natural Heritage Program
NEPA	National Environmental Policy Act
OHWM	ordinary high water mark
QHA	qualitative habitat assessment
RCA	restoration/conservation area
RHCA	riparian habitat conservation area
RMO	riparian management objective
RMZ	riparian management zone
SFLMP	State Forest Land Management Plan
SMZ	streamside management zone
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WMZ	wetland management zone

1. CURRENT LEGAL AND AGENCY STATUS

Information on the legal and agency status of redband trout (*Oncorhynchus mykiss gairdneri*) was obtained from *Montana Animal Species of Concern* (Carlson 2003) published jointly by Montana Fish, Wildlife and Parks (MFWP) and the Montana Natural Heritage Program (MNHP). This includes information from the federal and state agencies listed below, except for the Montana Department of Natural Resources and Conservation (DNRC), and except where a reference indicates otherwise.

- U.S. Fish and Wildlife Service (USFWS)—not listed (in 2000, the listing of populations in the Great Basin and Kootenai River drainage as threatened or endangered was determined to be not warranted [Federal Register (FR), Vol. 65, No. 73]).
- MNHP and Montana Fish, Wildlife, and Parks (MFWP) —Species of concern. State ranking of S1 (Critically imperiled because of extreme rarity or because of some factor(s) of its biology making it especially vulnerable to extinction).
- DNRC Forest Management Bureau—sensitive.
- U.S. Forest Service (USFS), Montana—sensitive.

2. POPULATION STATUS, DISTRIBUTION, AND SEASONAL PRESENCE

The redband trout is a subspecies of rainbow trout (*O. mykiss*). The rainbow trout is widely distributed in western North America and is segregated into three forms: (1) coastal rainbow trout west of the Cascade/Sierra mountain divide; (2) interior Columbia River redband trout; and (3) the Sacramento-San Joaquin redband trout (Behnke 1992). Historically, redband trout were widely distributed in freshwaters west of the Rocky Mountains from northern California to northern British Columbia, including habitats ranging from desert basins to high mountain coniferous forests (Behnke 1992). Interior Columbia River Redband trout are native to the upper Klamath River Basin, isolated interior basins of Oregon, and the Fraser and Columbia River drainages east of the Cascade Mountains extending upstream to barrier falls on the Pend Oreille, Spokane, and Snake Rivers (Allendorf et al. 1980; Behnke 1992).

Redband trout are known to exhibit both nonanadromous (resident) and anadromous (ocean migratory/steelhead) forms. Lee et al. (1997) divided nonanadromous resident redband trout into those that are sympatric or allopatric with steelhead. Allopatric redband trout are those that evolved outside of the historical range of steelhead, whereas sympatric redband trout are historically derived from, or occur within the range of steelhead.

Redband trout were the most widely distributed salmonids in the Columbia River Basin, historically occupying 73 percent of the subwatersheds (Lee et al. 1997). Only the allopatric form, which once occupied about 18 percent of all subwatersheds in the Columbia River basin, is native to Montana. Redband trout remain the most widely distributed salmonids in the Columbia River basin, with sympatric and allopatric forms known or predicted to occupy 64 percent of their historical range, which is equivalent to 47 percent of the entire Columbia River Basin) (Lee et al. 1997). However, less is known about the current distribution of different redband trout forms than of other salmonids. This is due to lack of information and the inability to differentiate juvenile steelhead, sympatric redband trout and non-native strains of rainbow trout (Lee et al. 1997). Among allopatric redband trout, strong populations occur in about 9 percent of the historical range and 18 percent of the current known distribution.

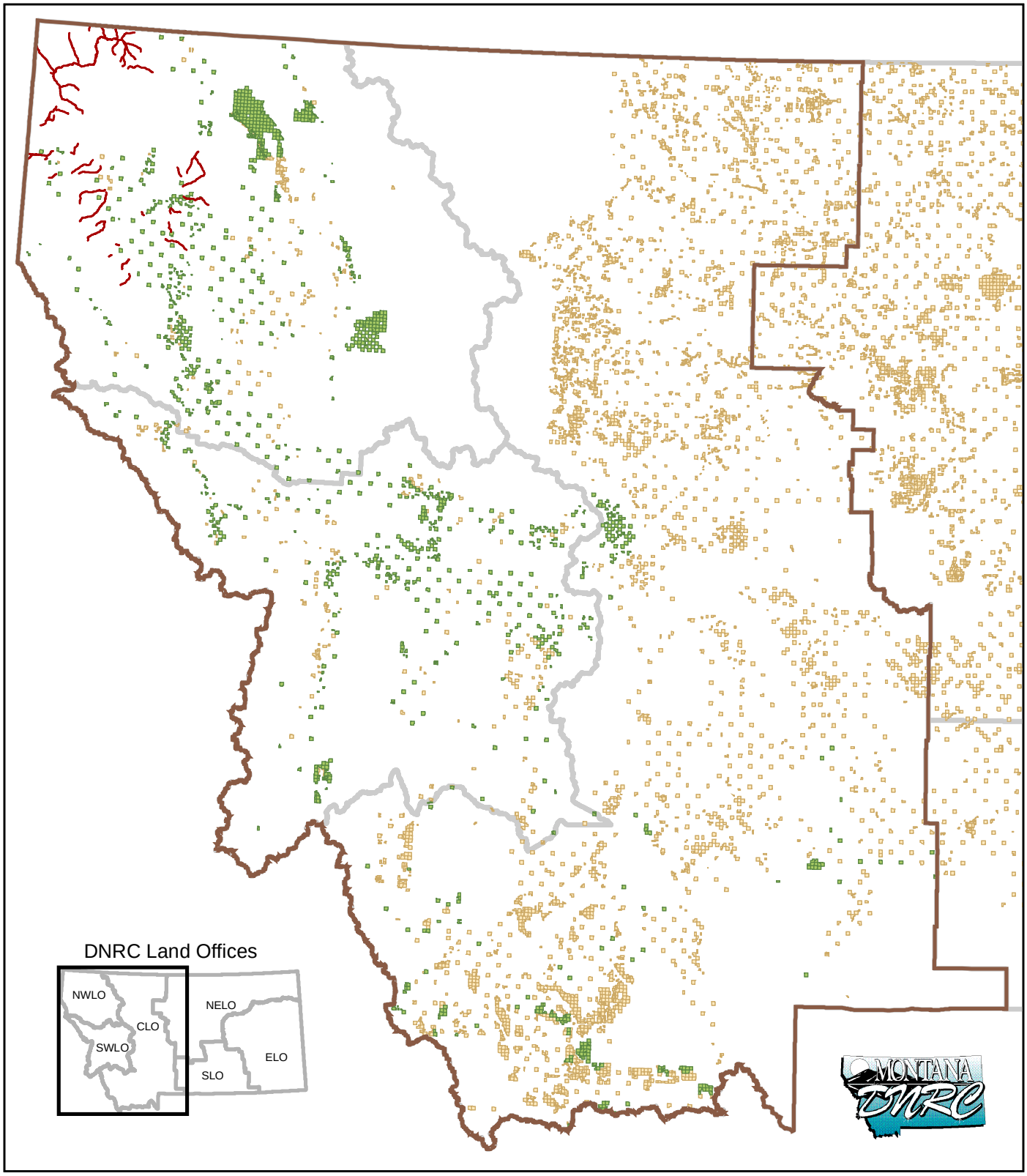
In Montana, redband trout only occur in the Kootenai River drainage and are the furthest inland population of redband trout in the Columbia River basin (Figure 1). The historical upstream limit of redband trout was once believed to be Kootenai Falls, located approximately 5 miles east of Troy, Montana (Allendorf et al. 1980). However, the historical distribution is now believed to have extended upstream of Kootenai Falls near the present-day Libby Dam or the Fisher River (Muhlfeld 2003 personal communication). In general, the present distribution of redband trout in Montana is characterized by widely disconnected remnant populations of genetically pure stocks (Muhlfeld 2003 personal communication).

According to genetic surveys, historical redband trout populations were likely native to low-gradient, valley-bottom streams throughout the Kootenai River drainage. These fish are presently restricted to some headwater areas, in large part due to the widespread introduction of hatchery rainbow trout, which has caused major genetic divergence among local redband trout populations (Allendorf et al. 1980; Muhlfeld 2003 personal communication). It is believed that redband trout that are at least 95 percent genetically pure occupy about one-third of the stream miles historically occupied by redband trout in Montana (Muhlfeld 2003 personal communication).

Genetically pure populations of redband trout have been identified in Callahan Creek, Basin Creek, the upper north (British Columbia) and east forks of the Yaak River, upper Big Cherry Creek, Granite Creek, and portions of the upper Fisher River including Wolf Creek, Pleasant Valley Creek, Island Creek, and Silver Butte Creeks (Allendorf et al. 1980; Huston 1995; Hensler et al. 1996; Hensler 2004 personal communication). Populations of redband trout inhabiting Callahan Creek and the upper Yaak River

drainage are isolated by barrier falls in each system. These remnant populations, which are spatially fragmented and isolated from genetic exchange, represent the most substantial remaining sources of native redband trout capable of reestablishing their historical distribution in Montana downstream of Kootenai Falls. Extensive ongoing genetic sampling is being conducted which will aid in more accurately identifying the current distribution of genetically pure strains of redband trout in the Kootenai River basin (Muhlfeld 2003 personal communication).

Additionally, an unknown number of Kamloops strain redband trout move from Kootenay Lake in British Columbia upstream into Montana to spawn in the Kootenai River in the spring. These large lake-dwelling fish are native to Kootenay Lake. Some of these fish may also spawn in tributaries such as Callahan Creek (Muhlfeld 2003 personal communication).



N

0 15 30 45 60 Miles

Redband Trout Distribution
Project Area
Other Trust Land
Planning Area Boundary
Land Office Boundary

Figure 1
Redband Trout Distribution in Western Montana

Data Source: Montana Department of Fish, Wildlife & Parks MFISH Database (downloaded September 2, 2003).

Parametrix

Map prepared by Parametrix, Inc., September 29, 2005.
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3. KEY LIFE REQUISITES

Redband trout exhibit several life-history forms including anadromous (ocean migratory), adfluvial (lake migratory), fluvial (river migratory), and nonmigratory resident forms (Lee et al. 1997). In Montana, the redband trout population within the Kootenai River drainage primarily consists of the resident form (Muhlfeld 1999). These resident redband trout are isolated in small patches of habitat, often upstream of barriers, and are distinguished from other rainbow trout populations in the Kootenai River watershed by lack of genetic introgression with non-native rainbow trout stocks (Muhlfeld 2003 personal communication). The Kamloops strain of redband trout migrate upstream from Kootenay Lake in British Columbia and spawn in Kootenai River tributaries in Montana downstream from Kootenai Falls. The Kamloops strain attains a large body size due to their piscivorous diet of kokanee salmon (*Oncorhynchus nerka*). It is generally assumed that populations within streams and rivers rely heavily on aquatic and terrestrial invertebrates as food sources (Lee et al. 1997). Migratory fluvial and/or adfluvial components of the population may be undetectable due to hybridized populations inhabiting the lower portions of the Kootenai River drainage (Muhlfeld 2003 personal communication).

Throughout their entire range, redband trout are found in a wide variety of habitat conditions that are often more extreme than conditions associated with other species (Lee et al. 1997). In particular, some redband trout populations are found in turbid and alkaline waters that range from near freezing to over 25 degrees Celsius in the deserts along the southern margin of the Columbia River Basin.

Though redband trout are adapted to a wider range of environmental conditions than other salmonids, some general observations can be made. Redband trout spawn exclusively in flowing waters and typically migrate to spawning areas in the spring. Migration timing is affected by water temperature and stream flow. After spawning, resident redband trout maintain restricted home ranges until migrating to overwintering areas in the fall (Thurow 1990). Juveniles of migratory forms typically move downstream to lakes or rivers after one to three years in natal streams. As with other salmonid species, redband trout abundance has been strongly correlated with riparian cover components, including undercut banks, large woody debris (LWD), and overhanging vegetation (Lee et al. 1997).

In Basin Creek, a low-gradient third-order tributary of the Kootenai River in Montana, adult resident redband trout initiated redd construction in June, about ten days after the peak in spring flows (Muhlfeld 2002). Redband trout generally selected redd sites in shallow pool tailout areas (depth range = 7.8 to 11.8 in) with moderate water velocities (velocity range = 1.3 to 2.3 ft/s) dominated by gravel substrate (diameter = 0.08 to 0.2 in). Pool tailout areas are favorable for adequate seepage of interstitial water necessary for the oxygenation of eggs and removal of waste products (Bjornn and Reiser 1991).

In Basin Creek and Callahan Creek, a fourth-order tributary of the Kootenai River, juvenile and adult redband trout were found to prefer deep microhabitats (≥1.3 ft) having low to moderate water velocities (≤1.6 ft/s) (Muhlfeld et al. 2001a). Age-0 (young-of-year) redband trout selected slow water (≤0.3 ft/s) and shallow depths (≤0.7 ft) located along stream margins near shore. Age-0, juvenile and adult redband trout strongly selected pools and avoided riffles. Run habitats were used by juveniles and adults in proportion to habitat availability, but were used more than expected by age-0 fish. In general, it was determined that low-gradient, mid-elevation reaches with an abundance of complex pools were critical areas for the production of redband trout (Muhlfeld et al. 2001a). During the fall and winter, adult redband trout occupied small home ranges and utilized deep pools dominated by cobble/boulder substrate and/or LWD (Muhlfeld et al. 2001b). Refer to Table 1 for a summary of the habitat requirements of redband trout.

Table 1. Habitat Requirements of Columbia River Redband Trout

Life Stage/Attribute	Need	Preference
Spawning		
Spawning Water Depth		7.8 to 11.8 in[a]
Spawning Water Velocity		1.3 to 2.3 ft/sec[a]
Spawning Substrate	Clean gravels	0.08 to 0.2 in[a]
Spawning Temperature	4 to 14 °C (daily average) most frequently observed in field for trout and salmon[c]	Initiated when mean daily temperature reached 6 °C about 10 days after peak spring discharge[a]
Incubation		
Habitat Characteristics	Approximately 80 percent of redds located in pool tailouts that are favorable for adequate seepage velocity of interstitial water, oxygenation of eggs, and removal of waste products[a, b]	
Incubation Temperature	4 to 12 °C (constant) for good survival[c] 6 to 10 °C (constant) optimal[c]	
Rearing and Adult		
Juvenile Rearing and Adult Temperature	Juvenile: 13 to 20 °C (constant), optimal growth with unlimited food[c] Juvenile: 10 to 16 °C (constant), optimal growth with limited food[c]	
Depth		Age-0: ≤0.7 ft[d] Juvenile and adult: ≥1.3 ft[d]
Cover		Age-0: Shallow microhabitats along stream margins; pool mesohabitat; avoidance of riffles[d] Juvenile and Adult: Deep microhabitats; pool mesohabitat; density of fish positively correlated with abundance of pools and negatively related to stream gradient; avoidance of riffles[d] Winter Habitat: deep pools dominated by cobble/boulder substrate and large woody debris[e]

Table 1. Habitat Requirements of Columbia River Redband Trout (continued)

Life Stage/Attribute	Need	Preference
Water Velocity		Age-0: ≤0.3 ft/s[d] Juvenile and adult: ≤1.6 ft/s[d]
Substrate		Age-0: fines, small and large gravels; avoidance of large substrates[d] Juvenile and adult: wide range of substrates, generally clean gravels and cobbles[d] Winter Habitat: cobble/boulder substrate[e]
Fish Access	Natural and artificial barriers may benefit remaining populations[f]	No artificial physical barriers
Feeding and Growth	Generally macroinvertebrates in streams; highly piscivorous in lakes[g]	

Sources:

[a] Muhlfeld 2002
[b] Bjornn and Reiser 1991
[c] general temperature range suitable for trout and salmon
[d] Muhlfeld et al. 2001a
[e] Muhlfeld et al. 2001b
[f] Muhlfeld, personal communication
[g] Lee et al. 1997

Notes:

in = inch
ft = foot
°C = degree Celsius
ft/s = foot per second
≤ = less than and equal to

3.1 CORRIDOR NEEDS

According to genetic surveys, redband trout were likely native to low-gradient, valley-bottom streams throughout the Kootenai River drainage (Knudsen et al. 2002; Muhlfeld 2003 personal communication). However, the current distribution of redband trout in Montana is limited to remnant populations in headwater areas that are spatially fragmented and generally isolated from genetic exchange. Under ideal conditions, removal of all artificial barriers would benefit redband trout populations by providing connection among habitats and populations, but redband trout are currently restricted to headwater areas largely due to the widespread introduction of hatchery rainbow trout below fish passage barriers, which has caused major genetic divergence among local redband trout populations (Knudsen et al. 2002; Muhlfeld 2003 personal communication). Therefore, existing barriers should be identified and monitored to determine the potential effects of barrier removal or maintenance of redband trout stocks. Where necessary, new barriers may even be warranted to minimize or prevent impacts to redband trout populations through competition and/or hybridization with native and non-native salmonids (such as rainbow trout, brook trout, and westslope cutthroat trout). However, the effects of such actions on other native fish species which occupy headwater habitats (e.g. bull trout and westslope cutthroat trout) must also be considered.

3.2 KEY BIOLOGICAL RELATIONSHIPS

In the Columbia River basin, redband trout historically shared habitats with several potential predatory fish species, such as northern pikeminnow (*Ptychocheilus oregonensis*), bull trout (*Salvelinus confluentus*), chinook salmon (*Oncorhynchus tshawytscha*), and coastal rainbow trout (including steelhead). Hybridization and competition with other fish species, particularly introduced species, are

biotic factors influencing the status of redband trout populations. In general, introduced fish species create risks of genetic introgression, competition for food and space, predation, and increased exposure to disease (Lee et al. 1997).

In particular, there is concern that In particular, there is concern that the redband trout population within the Kootenai River basin is at risk of extinction. Widespread introductions of non-native trout, primarily coastal rainbow trout and eastern brook trout, have lead to intensive competition, species replacement, and hybridization with non-native rainbow trout stocks (Muhlfeld 2003 personal communication). The introduction of non-native trout above geologic barriers and in adjacent drainages poses a severe threat to the genetic purity and population persistence of isolated populations of redband trout.

4. SENSITIVITY TO COVERED ACTIVITIES

The following DNRC forest management activities are proposed for coverage under the habitat conservation plan (HCP). The sensitivity of redband trout to these activities may depend on the time of year, duration and extent of the activity, distance of the activity from the stream, and the condition of existing streamside management zones. Therefore, a more accurate evaluation of sensitivity to proposed activities should be conducted on a case-by-case basis. Potential sensitivities of the redband trout to these activities are described below.

4.1 TIMBER HARVEST

Timber harvest activities include those in upland and riparian areas. Potential effects of upland timber harvest on redband trout and their habitats are similar to the potential effects on all salmonid species, including the alteration of flow regimes, in particular, the increase of peak flows, which can lead to reduced bank and channel stability, and reduced groundwater inflows (Chamberlin et al. 1991). In addition, increased sediment delivery to streams can degrade pool quality, habitat complexity, and substrate conditions, and cause channel aggradation that blocks access to habitats.

Potential effects of riparian timber harvest on redband trout and their habitats include increased summer and decreased winter water temperatures due to the removal of shading and insulating vegetation; reduced large woody debris (LWD) recruitment caused by the removal of source vegetation; reduced pool quality, habitat complexity, channel stability, and bank stability caused by the removal of vegetation; and reduced substrate quality caused by increased sediment delivery due to streambank erosion (Chamberlin et al. 1991; Swanston 1991; Waters 1995)

4.2 SALVAGE HARVEST

Effects of salvage harvest on redband trout are similar to those of timber harvest, although impacts on riparian vegetation and stream shading are less because many of the trees that are salvage harvested are already dead.

4.3 THINNING

Effects of thinning on redband trout are similar to those of timber harvest, although impacts on riparian vegetation and stream shading are less because precommercial thinning activities do not result in a similar level of tree removal.

4.4 CONTROL AND DISPERSAL OF SLASH

Mechanized means of slash dispersal may potentially compact site soils and increase stream sedimentation. If these means of slash dispersal occur on steep slopes or in areas immediately adjacent to a stream or upslope of a stream without a functioning riparian buffer, they can negatively impact redband trout. Broadcast burning or pile burning can also lead to a loss of nutrients on the site. Hydrologic cycles, infiltration rates, and groundwater recharge capabilities of the site can also be altered.

4.5 PRESCRIBED BURNING

The effects of prescribed burning are similar to those of slash control. If a prescribed burn escapes and becomes an uncontrolled fire, resulting riparian vegetation loss can cause increased stream temperatures, which deleteriously affect redband trout habitat.

4.6 SITE PREPARATION

Site preparation does not include herbicide applications, but does include burning and scarification. The effects of prescribed burning are similar to those of slash control. Scarification can cause increased erosion and sediment delivery to streams, resulting in pool filling, redd entombment, and other effects deleterious to redband trout.

4.7 REFORESTATION

Reforestation activities would be expected to have a beneficial effect on redband trout. Reforestation increases slope stability and stream shading and reduces the amount of surface and subsurface runoff into streams.

4.8 WEED CONTROL

HCP-covered DNRC activities do not include herbicide applications, which can lead to direct effects such as acute or chronic toxicity. Other weed control activities, such as the replanting of disturbed areas with appropriate native vegetation, would be expected to have a beneficial effect on redband trout due to increased stream shading and decreased stream sedimentation.

4.9 ROAD CONSTRUCTION

Roads constructed for forest management are prevalent on managed forested and rangeland landscapes. Roads can change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of runoff, and sedimentation, as well as add pollutants (including heavy metals) and nutrients to roadside environments, including streams (Furniss et al. 1991; Trombulak and Frissell 2000). Road construction, use, and maintenance have the potential to deleteriously affect fish migration (blocked culverts), spawning (changes to substrate and stream flow), incubation (increased sedimentation or scour), and juvenile rearing (decreased riparian vegetation and changes to prey base). Roads may affect aquatic habitats at considerable distances, and a small area of road can affect a large downstream area (e.g. increases in sedimentation, debris flows, and peak flows affecting streams longitudinally) (Trombulak and Frissell 2000).

4.10 ROAD MAINTENANCE

The effects of road maintenance activities on redband trout are similar to those of road construction. Sediment delivery from roads to streams is of primary concern. Road maintenance activities such as road grading, sidecasting of road material, and the use of roads in wet weather can contribute to increased stream sedimentation.

4.11 FOREST INVENTORY

Forest inventory activities should not adversely affect redband trout or redband trout habitat.

4.12 MONITORING

Watershed monitoring activities, as described in Section 8, are not expected to have adverse effects on redband trout or redband trout habitat. Redband trout population monitoring may cause stress or mortality to individual redband trout if capture methods are used (e.g., electrofishing or netting). However, monitoring actions gather information necessary to improve management of redband trout populations, and, overall monitoring actions are expected to benefit these populations.

4.13 GRAZING OF CLASSIFIED FOREST LANDS

Livestock grazing affects redband trout habitat primarily by reducing streamside vegetation and directly impacting streambank conditions (Platts 1991). As described above, loss of insulating streamside vegetation can increase summer water temperatures and decrease winter temperatures. Loss of riparian vegetation, along with trampling of streambanks leads to increased erosion and sedimentation and loss of bank stability. In turn, this causes channel aggradation, decreased pool and substrate quality, and increased channel width. In addition, nutrient enrichment associated with livestock waste can alter biological communities and decrease dissolved oxygen concentrations (Platts 1991).

Grazing practices have affected DNRC land east of the Continental Divide, especially where the grazing occurs on small isolated blocks of state land. Rest and rotation grazing strategies may not be fully followed or implemented in areas where the only grazing land is in valley-bottom meadows along a thin thread of riparian area bordered on both sides by forest (Shepard 2003 personal communication).

4.14 GRAVEL QUARRYING FOR THE PURPOSES OF LOGGING AND ROAD CONSTRUCTION

Gravel quarries, if constructed near streams, can contribute to increased sediment delivery to streams. Sedimentation resulting from gravel quarries can negatively affect redband trout by causing physiological stress, altering aquatic habitat through pool filling and redd entombment, and potentially altering the forage base of adult and juvenile redband trout.

4.15 FERTILIZATION

Decomposing fertilizer, in the form of nitrogen, can produce materials toxic to fish, such as ammonia and nitrate. In general, small concentrations of these products in the water lead to sublethal physiological and histopathological effects rather than direct mortality (Norris et al. 1991). Fertilization may also potentially affect redband trout habitat by the alteration of water chemistry (e.g. hardness).

4.16 ELECTRONIC FACILITY SITES

Since these facilities are generally located on ridgetops, their primary negative effects on redband trout or redband trout habitat would be related to sedimentation from the construction of access roads (see Sections 4.9 and 4.10).

4.17 OTHER ACTIVITIES COMMON TO COMMERCIAL FOREST MANAGEMENT

Other activities, such as foot travel and fieldwork in DNRC controlled areas, should not contribute to adverse effects on redband trout or redband trout habitat.

5. MANAGEMENT NEEDS AND RECOMMENDATIONS

In general, in addition to restoring habitat structure, restoring natural processes is crucial for the restoration of salmonid populations (Reiman 2003 personal communication). Management priorities should focus on life history diversity, spatial diversity, connectivity, and maintenance of large, complex, interconnected systems. Land- and water-use practices, habitat loss, overharvest, hybridization, and a highly restricted geographical range are leading factors contributing to the decline of redband trout abundance, distribution, and genetic diversity in the Columbia River basin (Williams et al. 1989; Behnke 1992). Habitat degradation has been primarily attributed to poor land management practices, construction of dams and diversions, road construction, logging, grazing, and floodplain development.

According to a summary of the status of redband trout in Montana (http://www.fisheries.org/AFSmontana /SSCpages/redban%20status2.htm):

Long-term conservation and management of redband trout will require state and federal agencies to develop a comprehensive plan to protect and restore redband trout throughout their native range in Montana. One objective should be to develop a wild brood stock for reintroductions throughout the Kootenai River drainage. Montana Fish, Wildlife and Parks (MTFWP) is in the process of developing brood stocks that will be located at the Libby Field Station. Results of microsatellite analyses based on allozyme electrophoresis of several populations of redband trout in Montana and British Columbia indicate significant differences between watersheds and relatively small differences between populations within watersheds (Knudsen et al. 2002). In order for reintroduction programs to be genetically rational, watershed-specific stocks are needed for successful recovery programs. Habitat surveys should be conducted to identify streams suitable for reintroductions of redband trout. However, re-introduction efforts should be implemented with caution because introduction of a species to any aquatic habitat requires many considerations because species interactions are complex and difficult to predict (Li and Moyle 1981). Maintaining channel complexity and quality pool habitat throughout their limited range is probably essential to the persistence of this subspecies in Montana. Habitat improvement and conservation efforts are scheduled for the foreseeable future by MTFWP and the U.S. Forest Service.

DNRC has initiated an inventory of road stream crossing structures to evaluate the potential for fish passage barriers (see Section 8.2.1). Restoration of fish passage should be examined case by case because restoring fish passage for redband trout could unintentionally introduce competition and/or hybridization with other species, such as introduced rainbow trout stocks, brook trout, or westslope cutthroat trout (Shepard 2003 personal communication; Weaver 2003 personal communication; Muhlfeld 2003 personal communication).

6. CURRENT DNRC PROTECTIVE MEASURES

The most applicable regulations governing management of redband trout on DNRC state forest trust lands include the following sections from Best Management Practices for Forestry in Montana, including streamside management zones (SMZs), and the Administrative Rules of Montana (ARM) under Sub-Chapter 4 for State Forest Land Management (DNRC 2003a). These laws and rules were implemented to protect streams, wetlands, and watersheds from the negative effects of timber harvest and associated activities, such as road building. The primary features of these rules are to restrict the scope and range of activities that may pose a threat to aquatic habitat and species, including redband trout.

6.1 ADMINISTRATIVE RULES OF MONTANA

Rules in ARM related to the management of redband trout include those regulating road management, SMZs, wetland management zones (WMZ), riparian management zones (RMZ), fisheries, and sensitive species. The following text includes quoted sections of the applicable ARM rules in italicized text followed by a brief summary of key points and rules having particular significance to redband trout and stream habitat management.

36.11.421 ROAD MANAGEMENT

(1) The department shall plan transportation systems for the minimum number of road miles.

(a) The department shall only build roads that are necessary for current and near-term management objectives, as consistent with the other forest management rules.

(b) The department shall evaluate and use alternative yarding systems that do not require roads whenever possible.

(2) The department shall conduct transportation planning as part of landscape-level evaluations. The department shall also conduct an evaluation of existing and possible future transportation systems prior to road location and design. When planning transportation, the department shall consider:

(a) the relationship of access routes and road systems on adjacent sections, regardless of ownership. Managers shall plan systems cooperatively with adjacent landowners whenever practicable to minimize road construction.

(b) planning road systems cooperatively with adjacent landowners whenever practicable to minimize road construction.

(c) existing and probable future management needs of the tributary area, such as:

(i) coordination of department needs with adjacent ownership needs;

(ii) public access;

(iii) logging system capabilities;

(iv) forest improvement activities;

(v) fire protection; and

(vi) wildlife habitat protection.

(d) value(s) of resources being accessed for the proposed project as well as resources to be accessed from future road construction, road use or extension of transportation system.

(3) When planning the location, design, construction, and maintenance of all roads, the department shall:

(a) comply with BMP as necessary to avoid unacceptable adverse impacts or as funding is available to implement improvements to existing roads;

(b) build roads to the minimum standard necessary to best meet current and future management needs and objectives;

(c) manage roads to minimize maintenance;

(d) relocate existing roads if reconstruction, maintenance and/or use of existing roads would produce greater undesirable impacts than new construction; and

(e) use existing roads in SMZ only if potential water quality impacts can be adequately mitigated. The department shall primarily consider economic and watershed implications of relocating roads outside the SMZ.

(4) The department shall write contract specifications and administer construction projects to ensure roads are built as designed and to meet resource protection requirements.

(5) The department shall maintain roads commensurate with expected road use and appropriate resource protection.

(6) The department shall also maintain drainage structures and other resource protection measures on both restricted and open roads.

(7) The department shall include adequate maintenance requirements, proportional to road use, in all agreements for granting and acquiring rights-of-way, and the requirements shall be enforced during the administration of those agreements.

(8) The department shall plan road density to satisfy project level objectives, landscape-level plans and other forest management rules.

(9 The department shall determine which roads to close, abandon, or obliterate during project level analysis.

(10) The department shall consider closure or abandonment of roads accessible to motorized vehicles:

(a) that are non-essential to near-term future management plans; or

(b) where unrestricted access would cause excessive resource damage.

(i) In the Swan River state forest, the department shall plan road closures in accordance with the terms of the Swan Valley Grizzly Bear Conservation Agreement, dated February 23, 1995.

(11) The department shall consider for abandonment roads that are deemed non-essential. The department shall leave abandoned roads in a condition that provides adequate drainage and stabilization, while leaving intact the road prism and capital investment needed to construct that road.

(12) The department shall assess road maintenance needs by inspecting conditions on both open and closed roads every five years. The department shall then prioritize maintenance operations considering the results of the inspections.

(13) The department shall inspect existing road systems during the planning and review of proposed timber sales and other projects. The inspections are intended to provide information used for:

(a) road planning;

(b) construction and maintenance; and

(c) giving an opportunity for the correction of problem areas by incorporating corrective measures into planned projects.

(14) The department shall inspect road closure structures, such as gates and earth berms, as part of ongoing administrative duties and in response to notice of ineffective road closures received from the public. The department shall repair or modify ineffective closures or consider alternative methods of closure. Inspections would occur at least every five years. Repairs would be a high priority when allocating time and budget. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

The basic intent of the *Road Management* rules (ARM 36.11.421) is to minimize the number of roads and identify the long-term landscape needs for planning future road construction. Road management practices are often prioritized based on fish use or related concerns. Management activities include the abandonment/obliteration, monitoring, and maintenance of roads, particularly in areas of high erosion risk and the SMZ.

36.11.422 WATERSHED MANAGEMENT

(1) The department shall manage watersheds to maintain high quality water that meets or exceeds state water quality standards and protects designated beneficial water uses.

(2) The department shall incorporate BMP's into the project design and implementation of all forest management activities.

(a) BMP's appropriate for a given project or situation shall be determined during project development and environmental analysis. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

36.11.423 WATERSHED MANAGEMENT – CUMULATIVE EFFECTS

(1) The department shall include an assessment of cumulative watershed effects on projects involving substantial vegetation removal or ground disturbance. Using the analysis, the department shall ensure that the project will not increase impacts beyond the physical limits imposed by the stream system for supporting its most restrictive beneficial use(s), when considered with other existing and proposed state activities for which the scoping process has been initiated. The analysis shall identify opportunities, if any exist, for mitigating adverse effects on beneficial water uses.

(a) The department shall determine the necessary level of cumulative watershed effects analysis on a project level basis. The level of analysis shall depend on the:

(i) extent of the proposed activity;

(ii) level of past activities; and

(iii) beneficial uses at risk.

(b) The department shall complete a coarse filter screening on all projects involving substantial vegetation removal or ground disturbance. Except for small-scale projects with very low potential for impacts, additional analysis shall be required.

(c) The department shall complete a preliminary watershed analysis on projects when coarse filter evaluations determine there is anything other than low potential for cumulative impacts.

(d) The department shall complete a detailed watershed analysis when coarse filter screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects as a result of the proposal.

(e) The department shall establish threshold values for cumulative watershed effects on a watershed level basis.

(f) The department shall determine thresholds for cumulative watershed effects by taking into account such items as:

(i) stream channel stability;

(ii) beneficial water uses; and

(iii) existing watershed conditions.

(iv) The department shall set threshold values at a level that ensures compliance with water quality standards and protection of beneficial water uses with a low to moderate degree of risk.

(g) The department shall set threshold values for cumulative effects associated with projects proposed in the watershed of a water quality limited water body at a level that provides for protection of beneficial water uses with a low degree of risk.

(2) Whenever feasible, the department shall cooperate with other landowners in watersheds with mixed ownership to minimize cumulative watershed effects within acceptable levels of risk. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

36.11.424 WATERSHED MANAGEMENT – MONITORING

(1) The department shall develop and maintain a monitoring strategy to assess watershed impacts of land use activities and the effectiveness of mitigation measures. The monitoring strategy shall include:

(a) qualitative assessments, such as BMP audits, on most projects with a substantial amount of soil disturbance. For future applications, the department shall revise BMP's that fail to provide adequate protection;

(b) site-specific monitoring projects using quantitative assessment methods on selected sites to determine the effectiveness of BMP's and other commonly applied mitigation measures;

(c) assessments of habitat conditions on selected streams identified as supporting the fish species listed as threatened or endangered under the Endangered Species Act, 16 U.S.C. Sections 1531 through 1544, and sensitive fish species;

(d) evaluations of the effects of forest management activities on soils at selected sites; and

(e) an inventory and analysis of watershed impacts on state trust lands as funding allows.

(i) If conducted, the analysis shall be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. The department shall emphasize mitigation of existing water quality impacts in order to provide greater opportunities to produce trust income while maintaining beneficial uses.

(2) If watershed, soil, or fisheries monitoring indicate unacceptable impacts resulting from forest management activities, the department shall attempt to verify the problem, and correct or mitigate it to an acceptable level. When necessary, the department shall use the information collected to revise mitigation measures and/or modify future activities to avoid similar problems.

(3) The department shall participate in cooperative watershed monitoring effort with other agencies, public entities and private parties, where practical, when funding is available, and when the cooperative monitoring objectives are consistent with department monitoring objectives. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

The intent of *Watershed Management* rules (ARM 36.11.422, 36.11.423, and 36.11.424) are to meet non point-source water quality goals. It is important to note that cold-water fisheries are considered a primary beneficial use, and levels of assessment are determined by those beneficial uses at risk on a project-level basis. Most assessments are qualitative in nature, and project-specific data is often lacking. However, if sensitive-species management is a primary beneficial use, then collection of more quantitative data would likely occur, and this information would be used to mitigate or correct identified problems. Subsequently, corrective measures would be monitored and adapted over time to ensure effectiveness. Existing rules also recognize cooperative monitoring efforts among agencies and public and private entities.

36.11.425 WATERSHED MANAGEMENT – STREAMSIDE MANAGEMENT ZONES AND RIPARIAN MANAGEMENT ZONES

(1) The department shall establish a riparian management zone (RMZ) adjacent to the minimum width of the SMZ required under ARM 36.11.302 when forest management activities are proposed on sites with high erosion risk or on sites that are adjacent to fish bearing streams or lakes.

(2) The department shall determine the presence of high erosion risk from:

(a) established soil surveys;

(b) existing inventories; or

(c) site-specific field evaluations.

(3) When the department proposes forest management activities on sites determined to have high erosion risk:

(a) the department shall establish an RMZ with a minimum of 100 feet when activities are located on slopes greater than 25% but less than 35%;

(b) the department shall establish an RMZ with a minimum of 150 feet when activities are located on slopes greater or equal to 35%, but less than 50%;

(c) the department shall establish an RMZ with a minimum of 200 feet when forest management activities are located on slopes greater or equal to 50%; and

(d) the department may modify and shorten RMZ widths established for high erosion risk when topographic breaks, existing roads or other factors are present that reduce erosion risk and provide suitable sediment delivery filtration. Modified or shortened RMZ's must still meet the minimum width of the SMZ required under ARM 36.11.302.

(4) The following restrictions apply to forest management activities conducted within an RMZ established for high erosion risk:

(a) The department shall limit new road construction within an RMZ to situations in which:

(i) a stream crossing is required;

(ii) potential impacts can be adequately mitigated; or

(iii) alternative locations pose higher risk of resource impacts.

(b) The department shall restrict ground based equipment operations within the RMZ.

(i) The department shall not allow the operation of wheeled or tracked equipment within an RMZ when it is located on slopes greater than 35%.

(ii) The department shall not allow the operation of wheeled or tracked equipment within an RMZ when it is located on slopes less than 35%, unless the operation can be conducted without causing excessive compaction, displacement or erosion of the soil.

(iii) The department may allow the use of wheeled or tracked equipment inside of that portion of an SMZ or RMZ when operated from an established road on the side of the road away from the stream pursuant to ARM 36.11.304.

(c) The department shall restrict cable yarding of logs within and across an RMZ to cable systems and operations that do not cause excessive ground disturbance within the SMZ or RMZ.

(5) The department shall design harvest prescriptions conducted in SMZ's and RMZ's located adjacent to fish bearing streams to retain adequate levels of shade and potential large woody debris recruitment to the stream channel by:

(a) establishing an RMZ that when combined with the SMZ has a minimum slope distance equal to the site potential tree height of the proposed harvest stand at age 100 years;

(b) determining site potential tree height from site index curves developed for local or regional forest types; and

(c) determining site index of a stand by measuring tree height and age directly from suitable index trees located at the approximate minimum SMZ width.

(6) The department shall determine adequate levels of shade retention on a project level basis.

(a) Adequate levels are those levels that maintain natural water temperature ranges.

(7) The department shall determine adequate levels of large woody debris retention on a project level basis.

(a) Adequate levels are those levels that maintain stream channel form and function.

(8) The department shall retain all bank edge trees on timber harvests conducted adjacent to streams.

(9) Timber harvests within the SMZ and RMZ of a stream, lake, or other body of water supporting bull trout or any other fish or aquatic species listed under the Endangered Species Act, 16 U.S.C Sections 1531 through 1544, the department shall act pursuant to ARM 36.11.427.

(10) The department shall use existing roads in the SMZ or RMZ only if potential water quality impacts are adequately mitigated and beneficial uses are fully protected. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

36.11.426 WATERSHED MANAGEMENT – WETLAND MANAGEMENT ZONES

(1) The department shall establish a WMZ when forest management activities are proposed within or adjacent to an isolated wetland or adjacent to a wetland found within an SMZ.

(a) For isolated wetlands greater than 0.25 acre the WMZ boundary shall be 50 feet.

(b) For isolated wetlands smaller than 0.25 acre the WMZ boundary shall only include the wetland itself.

(c) For wetlands found within a SMZ, the WMZ boundary shall be 50 feet.

(2) The department shall meet all requirements of ARM 36.11.301 through 36.11.312 when conducting forest management activities within wetlands that are located within or intercepting an SMZ boundary.

(3) The criteria the department will use to identify wetlands are:

(a) plant species composition;

(b) soil characteristics; or

(c) depth of water table.

(4) The presence of one or more field indicators for any of the three following criteria shall be adequate for wetland designation:

(a) The department shall consider a site to meet the wetland plant species composition criteria for wetland identification if, under normal circumstances, more than 50% of the dominant plant species from all strata occupying the site are classified as:

(i) obligate wetland;

(ii) facultative wetland; or

(iii) facultative species.

(b) The department shall consider a site to meet the wetland hydrology criteria if the area is:

(i) inundated either permanently or periodically to a depth at which emergent vegetation interfaces with open water; or

(ii) the soil has a frequently occurring high water table that remains within 12 inches of the surface for more than 14 consecutive days during the growing season of the prevalent vegetation.

(c) The department shall consider a site to meet the criteria for wetland soils if the soils occupying the site are classified as hydric soils.

(5) The department shall avoid the use and construction of roads in a WMZ.

(a) The department shall use existing roads or construct roads in a WMZ only if potential water quality impacts are adequately mitigated and wetland functions are maintained.

(6) The department shall restrict harvest and equipment operations within a WMZ.

(a) The department shall limit harvest and equipment operations within a WMZ to low-impact harvest systems and operations that do not cause:

(i) excessive compaction;

(ii) displacement; or

(iii) erosion of the soil.

(b) The department shall limit operation of ground-based equipment in a WMZ to periods of:

(i) low soil moisture;

(ii) frozen soil; or

(iii) snow covered ground conditions.

(c) Where ground based skidding through an isolated wetland is necessary, the department shall minimize the number of skidding routes and the number of passes.

(d) The department shall restrict cable yarding of trees from within a WMZ to systems that fully suspend harvested logs; or partially suspend logs when conducted during periods of:

(i) low soil moisture;

(ii) frozen soil; or

(iii) snow covered ground conditions.

(7) The department shall design harvest prescriptions in a WMZ to protect and retain shrubs and sub-merchantable trees. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

Streamside, riparian, and wetland management zones (ARM 36.11.425 and 36.11.426) include the primary regulatory rules that protect stream, riparian, and wetland habitats important to redband trout. The Streamside Management Law (77-5-301 through 307 MCA) provides minimum regulatory standards for forest practices in the SMZ. The SMZ is defined as *the stream, lake, or other body of water and an adjacent area of varying width where management practices that might affect wildlife habitat or water quality, fish, or other aquatic resources need to be modified* [77-5-302(8)]. The SMZ encompasses a buffer strip at least 50 ft wide on each side of a stream, lake, or other body of water, measured from the ordinary highwater mark (OHWM), and extending beyond this mark to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils. Steep slopes require at least a 100-ft buffer. According to SMZ law, within at least 50 ft of any lake, stream, or other body of water, only selective logging may be conducted, and other activities, such as clearcutting and heavy equipment operation are generally prohibited. Refer to Section 6.2 for a more detailed description of the SMZ law.

State Forest Management Rules designate an RMZ and WMZ that provide an extension of the SMZ depending on site-specific conditions and beneficial uses, including the use of streams by sensitive or listed species. Currently, the rules are written so that the RMZ requirement (e.g. 100 ft, under 36.11.425 2a) is in addition to the required SMZ of 50 ft. However, the original intent was to make the RMZ width the total required width, thus including the required SMZ rather than adding to SMZ. The rule language is expected to be modified to reflect the original intent. It must also be noted that, if fish protection is the primary identified beneficial use and there are no additional risks of high erosion, then an extension of the SMZ using the RMZ prescriptions applies only to harvest activities near streams, and not to any other activities that may be associated with harvest, such as road construction and maintenance. However, in areas of high erosion risk, the RMZ applies to equipment operation and road construction and maintenance, not to harvest prescriptions.

36.11.427 FISHERIES

(1) The department shall minimize impacts to fish populations and habitat by implementing the watershed, SMZ, and WMZ rules contained in ARM 36.11.422 through 36.11.426.

(2) The department shall review forest management activities proposed adjacent to streams, lakes, or other bodies of water supporting bull trout or other fish and aquatic species listed as threatened or endangered under the Endangered Species Act, 16 U.S.C. Sections 1531 through 1544, pursuant to ARM 36.11.404 through 36.11.428.

(a) The department shall make reasonable efforts, in its sole discretion, to cooperate in the implementation of conservation strategies developed by the state of Montana and United States fish and wildlife service (USFWS) for the restoration and recovery of bull trout and other listed fish species.

(i) The department shall design forest management activities to protect bull trout habitat by implementing conservation strategies pursuant to The Restoration Plan for Bull Trout in the Clark Fork River Basin and Kootenai River Basin, Montana (June 2000).

(3) As designated by the department, pursuant to ARM 36.11.436 the department shall:

(a) design forest management activities to protect and maintain:

(i) westslope cutthroat trout;

(ii) yellowstone cutthroat trout;

(iii) artic grayling; and

(iv) all other sensitive fish and aquatic species.

(b) manage habitat supporting fish and aquatic species designated by the department as sensitive in a manner that complies with other rules concerning sensitive species.

(c) make reasonable efforts to cooperate in the implementation of state conservation strategies for the protection of:

(i) westslope cutthroat trout;

(ii) yellowstone cutthroat trout;

(iii) artic grayling; and

(iv) other fish species designated as sensitive by the department, as is practicable.

(4) When installing new stream crossing structures on fish-bearing streams, the department shall provide for fish passage as specified in 83-5-501, MCA, the Stream Protection Act (124 permits). (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

Protection of fisheries under ARM 36.11.427 is assumed to be achieved by the proper implementation of watershed, SMZ, RMZ, and WMZ rules, and through reasonable efforts to cooperate in the implementation of state and federal conservation strategies at the sole discretion of DNRC. Fisheries rules also specifically prioritize the protection of listed and sensitive species and the provision for fish passage, although fish passage criteria are not defined.

36.11.436 SENSITIVE SPECIES

(1) The department recognizes that certain plant and animal species, both terrestrial and aquatic, are particularly sensitive to human activities in managed forests. Populations of such species are usually small and/or declining. Continued adverse impacts from land management activities may lead to their being federally listed as threatened or endangered. Because sensitive species usually have specific habitat requirements, consideration of their needs is

recognized as a useful and prudent fine filter for ensuring the department meets the primary goal of maintaining diverse and healthy forests. Considering sensitive species in management actions helps ensure that decisions will be made appropriate to the fundamental philosophy and that additional federal listings will not be necessary.

(a) However, if objective analyses suggest that the underlying ecological forces would produce a distribution of cover types different than those existing, it is appropriate to move toward the historic pattern. Sensitive species considerations for habitat management are not intended to preclude a general move toward historic representation of cover types.

(2) The department shall manage to generally support populations of sensitive species on state trust lands. The department shall accomplish this by managing for site characteristics generally recognized as important for ensuring their long-term persistence. The department may accept localized adverse impacts, but only within the context of an overall strategy that supports habitat capability for these species.

(a) Department staff shall report notable observations of sensitive plant and animal species to the Montana Natural Heritage Program (MNHP) or other appropriate data repository.

(b) Sites identified as important on projects with identified sensitive plant species shall be monitored to assess implementation of mitigation measures. On selected department projects with listed sensitive animal species, periodic follow-up surveys would be conducted to assess how well management actions have provided for site conditions needed to support those populations. Deficiencies would be documented and used to guide future management actions and mitigations.

(*3) For sensitive plant species, the department shall protect important sites and/or site characteristics with mitigation measures applied to management activities likely to have substantial long-term impacts. Prior to conducting planned land management activities, the department, at its sole discretion, shall refer to databases maintained by the MNHP, the United States Forest Service (USFS) and/or other appropriate sources for information on occurrence of plant species of special concern. Where information indicates potential for sensitive plant species and their habitat to occur within project areas, field surveys and/or consultation with other qualified professionals may be required to determine the presence, location, and mitigation measures for sensitive plant species.*

(4) For sensitive animal species, the department shall provide habitat characteristics recognized as suitable for individuals to survive and reproduce in situations where land ownership patterns, underlying biological conditions, and geographical conditions allow for them. The department's contribution toward conservation of wide-ranging animal species that occur in low densities and require large areas to support self-sustaining populations would be supportive of, albeit subsidiary to, the principal role played by federal agencies with larger land holdings.

(5) For proposed projects, the department shall look for opportunities to provide for habitat needs of sensitive animal species, primarily through managing for the range of historically occurring conditions appropriate to the sites. In blocked ownerships this shall include consideration of such issues as connectivity and corridors. In scattered ownerships, the department shall not necessarily commit to providing all the life-requisites of individual members of sensitive species, particularly if adjacent landowners managed in ways to limit the potential for individuals on state trust lands to be part of functional populations.

(6) The forest management bureau chief shall maintain a list of sensitive animal and fish species specific to each administrative land office. The department shall develop and modify this list

using information and classification systems developed by the USFS, USFWS, MNHP and, for fish species only, the FWP. The department shall use this list at the project level for identifying species appropriate to consider in project analyses at each administrative area office. The department shall base listing by land office on general geographic distribution and habitat affinities of animal species, and would not require site-specific evidence of presence on state trust lands. Additions to, or deletions from this list, of any animal not already categorized as sensitive by USFS region one, or as "fish species of special concern" by FWP, would require written justification. The department would not routinely conduct site-specific surveys for the presence of sensitive animal species. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)

Sensitive species are specifically addressed under ARM 36.11.436. These rules are designed to ensure that sensitive species are adequately considered in assessments and management decisions. The Forest Management Bureau maintains a list of sensitive species to identify species to consider in project analyses. This list is modified using information and classification systems developed by the USFS, USFWS, MNHP, and MFWP.

6.2 STREAMSIDE MANAGEMENT ZONES

The Streamside Management Law (77-5-301 through 307 Montana Code Annotated [MCA]) and administrative rules adopted under the SMZ Law provide minimum regulatory standards for forest practices within SMZs. The Streamside Management Law prohibits activities that pose a threat to water quality, soils, fish and wildlife habitat. Prohibited activities include broadcast burning; operation of wheeled or tracked vehicles, except on established roads; clearcutting; road construction, except when necessary to cross a stream or wetland; storage, use, disposal of hazardous wastes in a manner that pollutes streams, lakes, or wetlands; or dumping gravel, dirt, rocks or logging slash into streams, wetlands or watercourses. Clearcutting is prohibited within the SMZ.

SMZ widths are directly dependent on SMZ slope and stream class. Stream classes are defined as:

- *Class 1 stream segments: Support fish, or do not support fish but flow at least 6 months of the year, and contribute surface flow to another stream, lake, reservoir or pond covering an area greater than 0.1 acre.*
- *Class 2 stream segments: Do not support fish, but contribute flow to another stream, lake, reservoir or pond covering at least 0.1 acre; and flow for less than 6 months; or do not contribute surface flow to another stream, lake reservoir or pond, but do flow at least 6 months of the year.*
- *Class 3 stream segments: Have no fish, rarely contribute surface flow to another body of water and normally do not flow more than 6 months of the year.*

An overall summary of the rules are provided below, and Table 2 lists the required SMZ for each type of waterbody, as well as the requirements for leaving trees within the SMZ.

Table 2. SMZ Widths for Various Stream Types and Lakes

Waterbody Type	SMZ width (ft) if slope is less than or equal to 35 percent[a]	SMZ width (ft) if slope is greater than 35 percent[a]	Tree Retention Requirements Within SMZ
Class 1 Stream	50	100[b,c]	Retain at least 50 percent of trees ≥8-in. on each side of stream or 10 trees per 100 ft segment, whichever is greater
Class 2 Stream	50	100[b,c]	Retain at least 50 percent of trees ≥8-in. on each side of stream or 5 trees per 100 ft segment, whichever is greater
Class 3 Stream	50	50	Retain shrubs and submerchantable trees
Lakes	50	100[b,c]	Retain at least 50 percent of trees ≥8-in. dbh on each side of stream or 10 trees per 100 ft segment, whichever is greater

[a] Where the normal SMZ boundary intercepts a wetland, the SMZ boundary is extended to include the wetland.

[b] When an established road exists between 50 and 100 ft from the OHWM, the SMZ shifts inward to follow the toe of the road fill.

[c] If the ground slope within the 100-foot SMZ decreases to 15 percent or less for a width of 30 ft or more to form a bench and the edge of the bench is between 50 and 100 ft, the SMZ boundary is the edge of the bench nearest the stream. If the bench begins within 50 ft of the OHWM and 30 ft or more of the bench extends beyond the 50 ft, then the SMZ boundary is 50 ft.

dbh=diameter at breast height

In addition, DNRC has developed specific rules governing forestry practices within the SMZ. Selected rules are listed in italics in the following paragraphs.

Rule 3: (36.11.303) - Broadcast Burning

(1) Broadcast burning in the SMZ is prohibited unless approved by the department under a site-specific alternative practice

Rule 4: (36.11.304) - Equipment Operation in the SMZ

(1) Operation of wheeled or tracked equipment in the SMZ except on established roads is prohibited except as provided in this rule.

(2) In order to permit timber harvest on wetlands under conditions that protect the integrity of the SMZ, an operator may, as an alternative practice without site-specific approval, operate wheeled or tracked equipment from the outside edge of an SMZ to within 50 feet of the ordinary high water mark wherever:

(a) The SMZ extends beyond 50 feet from the ordinary high water mark to include adjacent wetlands;

(b) There exist winter conditions with adequate snow or frozen ground; and

(c) Operation of the wheeled or tracked equipment:

(i) Does not cause rutting or displacement of the soil;

(ii) Protects and retains shrubs and submerchantable trees to the fullest extent possible;

(iii) Does not remove stumps; and

(iv) Otherwise conserves the integrity of the SMZ.

(3) In order to minimize road construction and skid trails necessary for timber harvest on lands adjacent to the SMZ, an operator may, as an alternative practice without site-specific approval, cross the SMZ and the stream or other body of water with wheeled or tracked equipment on a

class 3 stream segment or other body of water at locations spaced approximately 200 feet apart or more provided that:

(a) Crossings are located in areas where the stream or other body of water is dry and the banks and bottoms are stable;

(b) Excavation is minimized;

(c) The capacity of the stream channel or other body of water is maintained; and

(d) The distance traveled through the SMZ is minimized.

(4) In order to minimize road construction necessary for timber harvest on lands adjacent to the SMZ, an operator may, as an alternative practice without site-specific approval, operate wheeled or tracked equipment inside the SMZ off of established roads on the side of the road away from the stream wherever:

(a) An established road exists inside the SMZ or construction of a road inside the SMZ is authorized under ARM 26.6.606

(b) The toe of the road fill nearest the stream is at least 25 feet from the ordinary high water mark; and

(c) Operations are conducted in such a manner that:

(i) Wheeled or tracked equipment stays out of wetlands except under winter conditions as provided in (2) above;

(ii) All skidding of logs takes place on designated skid trails located approximately 200 feet apart or more;

(iii) all skid trails in such areas are reclaimed by installing erosion control measures and reestablishing vegetative cover;

(iv) drainage features are established or reestablished on all roads used under this section;

(v) logs are not decked on the side of the road toward the stream; and

(vi) no landings are constructed in the SMZ.

(5) When logs are being winched or cable yarded across a class 1 or 2 stream segment by equipment located outside the SMZ, logs must be fully suspended unless otherwise authorized pursuant to the Natural Streambed and Land Preservation Act of 1975, 75-7-101.

(6) The department may also approve operation of wheeled or tracked equipment in the SMZ as a site-specific alternative practice only under conditions that:

(a) Conserve the integrity of the SMZ;

(b) Do not cause rutting of the soil; and

(c) Protect the residual stand of shrubs and trees.

<u>Rule 6: (36.11.306) - Road Construction in the SMZ</u>

(1) The construction of roads in the SMZ is prohibited except when necessary to cross a stream or wetland unless approved by the department under a site-specific alternative practice or as provided in this rule. The construction of roads across streams, wetlands or other bodies of water is not regulated by these rules but may be subject to other state and federal laws and regulations.

(2) Road fill material must not be deposited into the SMZ except as needed to construct crossings.

(3) In order to minimize excavation for road construction on erosive soils characteristic of Eastern Montana, an operator may, as an alternative practice without site-specific approval, construct or locate a road inside the SMZ on class 3 stream segments in the eastern zone only wherever:

(a) The slope of the SMZ immediately adjacent to the stream is 10% or less for a distance of at least 25 feet from the ordinary high water mark;

(b) There exists in the outer portion of the SMZ a hillside with slopes in excess of 35%; and

(c) The road is constructed or located on the gentler slopes in such a manner that:

(i) Cutting and filling of earthen material is minimized;

(ii) The toe of the road fill is located at least 15 feet from the ordinary high water mark;

(iii) The road is located as far away from the ordinary high water mark as is practical; and

(iv) Road drainage features are installed as needed to minimize sediment delivery to streams.

Rule 8: (36.11.308) - Side-casting of Road Material

(1) The side-casting of road material into a stream, lake, wetland, or other body of water during road maintenance operations is prohibited in the SMZ.

Rule 9: (36.11.309) - Depositing Slash

(1) Depositing slash in streams, lakes, or other bodies of water is prohibited unless approved by the department under a site-specific alternative practice subject to other state and federal law and regulations.

6.3 BEST MANAGEMENT PRACTICES

DNRC has defined best management practices (BMPs) for forestry in Montana (DNRC 2002a). BMPs are referred to in ARM 36.11.422 (see Section 6.1 for text of rules). Many of the BMPs, as developed by DNRC, apply directly to the protection of water quality and aquatic habitat. Although the specific BMPs are not regulatory in and of themselves, adherence to BMPs is presumed to be a primary mechanism for achieving water quality standards for nonpoint source activities in Montana. Therefore, because the implementation of BMPs by DNRC is required under ARM 36.11.422, this effectively makes DNRC BMPs regulatory. A partial list of the BMPs most pertinent to redband trout and their habitat, is excerpted below (in italics) from DNRC (2002a). The BMPs marked with an asterisk are those that are not monitored during routine field audits. For a complete list of BMPs see DNRC (2002a).

III. ROADS

A. Planning and Location

4. Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope. Avoid slumps and slide-prone areas characterized by steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture-laden or unstable toe slopes, seeps, wetlands, wet meadows, and natural drainage channels.

5. Minimize the number of stream crossings and choose stable stream crossing sites.

B. Design

*3. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible.**

4. Design roads to minimize disruption of natural drainage patterns. Vary road grades to reduce concentrated flow in road drainage ditches, culverts, and on fill slopes and road surfaces.

C. Road Drainage

1. Provide adequate drainage from the surface of all permanent and temporary roads. Use outsloped, insloped, or crowned roads, and install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.

5. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at outlet of drainage features. Crossdrains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection.

7. Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment doesn't reach surface water. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.

D. Construction (see also Section V on stream crossings)

*1. Keep slope stabilization, erosion and sediment control work current with road construction. Install drainage features as part of the construction process, ensuring that drainage structures are fully functional. Complete or stabilize road sections within same operating season.**

2 Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means.

3. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment (example, slash filter windrow). When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can also provide an economical way of disposing of roadway slash. Limit the height, width and length of "slash filter windrows" so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.

*4. Minimize earthmoving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.**

5. Construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion.

6. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill.

*7. Consider road surfacing to minimize erosion.**

8. Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.

9. *Minimize sediment production from borrow pits and gravel sources through proper location, development and reclamation.*

10. *When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces. Prior to reconstruction of existing roads within the SMZ, refer to the SMZ law. Consider abandoning existing roads when their use would aggravate erosion.*

E. Maintenance

2. *Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.*

5. *Haul all excess materials removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid sidecasting in locations where erosion will carry material into a stream. **

8. *Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; reseed and/or scarify; and, if necessary, recontour and provide water bars or drain dips.*

IV. TIMBER HARVESTING, AND SITE PREPARATION

A. Harvest Design

4. *Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction. Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes. **

5. *Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Limit the grade of constructed skid trails on geologically unstable, saturate, highly erosive, or easily compacted soils to a minimum of 30%. Use mitigating measures, such as water bars and grass seeding, to reduce erosion on skid trails.*

6. *Minimize the size and number of landings to accommodate safe, economical operation. Avoid locating landings that require skidding across drainage bottoms.*

B. Other Harvesting Activities

1. *Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40 percent unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.*

2. *Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen (see Section VI on winter logging).*

3. *Use directional felling or alternative skidding systems for harvest operations in isolated wetlands. **

4. *For each landing, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.*

C. Slash Treatment and Site Preparation

1. *Rapid reforestation of harvested areas is encouraged to reestablish protective vegetation.*
2. *Limit water quality impacts of prescribed fire by constructing water bars in firelines; not placing slash in drainage features and avoiding intense fires unless needed to meet silvacultural goals. Avoid slash piles in the SMZ when using existing roads for landings.*

V. STREAM CROSSINGS

A. Legal Requirements

1. *Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures, fords, riprapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits.*

   Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes on- site review, and the permitting process may take up to 60 days.
2. *Stream-crossing projects initiated by federal, state or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks), rather than the 310 permit.*
3. *A short-term exemption (3a authorization) from water quality standards is necessary unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. Contact the Department of Environmental Quality in Helena at 444-2406 for additional information.*

B. Design Considerations (Note: 310 permit required for perennial streams)

1. *Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage to stream crossings. Direct drainage flows away from the stream crossing site or into an adequate filter.*
2. *Avoid unimproved stream crossings. When a culvert or bridge is not feasible, locate drive-throughs on a stable, rocky portion of the stream channel.*

C. Installation of Stream Crossings (Note; 310 permit required for perennial streams)

1. *Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.*
2. *When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid culvert outfall barriers. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage.*

3. *Design stream-crossings for adequate passage of fish (if present), minimum impact on water quality, and at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.*

4. *Install stream-crossing culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible.*

5. *Consider dewatering stream crossing sites during culvert installation.**

6. *Maintain a 1-foot minimum cover for stream-crossing culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger culverts, to prevent crushing by traffic.*

7. *Use culverts with a minimum diameter of 15 inches for permanent stream crossings.**

D. *Existing Stream Crossing*

1. *Existing stream crossing culverts shall have adequate length to allow for road fill width and have adequate capacity to allow for the passage of the 25-year frequency runoff. To prevent erosion of fill, provide or maintain armoring at inlet and/or outlet with rock or other suitable material where feasible. Maintain fill over culvert as described in V.C. 6.*

7. ADDITIONAL PROTECTIVE MEASURES DEVELOPED BY OTHER AGENCIES/HCPS

In addition to the protective measures that are directly applicable to DNRC (including those measures regulatory in nature or those developed by or for DNRC), other agencies/entities have also developed measures to protect redband trout and their habitat. These measures, which are summarized below, include Inland Native Fish Strategy (INFISH) guidelines developed by the USFS and those measures covered under the Plum Creek HCP for forest activities in Montana. These measures are not required to be enforced by DNRC.

7.1 INLAND NATIVE FISH STRATEGY (INFISH)

The USFS has adopted the INFISH *Selected Interim Direction* (USFS 1995). INFISH is a strategy to apply federal management guidelines to protect native fish in order to reduce the risk of population loss and negative impacts to aquatic habitat. This amendment included the establishment of riparian management objectives (RMOs) and riparian habitat conservation areas (RHCAs). The INFISH strategy consists of several components, including:

- interim RMOs to achieve riparian goals,
- delineation of RHCAs,
- development of standards and guidelines, and
- monitoring requirements.

Specific standards and guidelines were developed in INFISH management strategies to address road management, grazing, recreation, minerals, fire/fuels, lands, general riparian management, watershed and habitat restoration, and fisheries and wildlife restoration.

The INFISH component that specifically relates to fish and in-stream habitat quality is the RMO. The RMOs identify habitat criteria regarding water temperature, LWD, pool frequency, width/depth ratio, and bank stability (USFS 1995). The six individual RMOs are discussed below (Table 3).

Table 3. Interim Riparian Management Objectives Under INFISH

Parameter	INFISH Riparian Management Objective Guideline
Water Temperature	No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the daily maximum temperature during the warmest 7-day period). Maximum water temperature below 15°C within adult-fish-holding habitat and below 9°C within spawning and rearing habitat.
Large Woody Debris	>20 pieces per mile; >12 in diameter; >35 ft length
Pool Frequency	Wetted width of 10 ft = 96 pools per mile; wetted width of 20 ft = 56 pools per mile
Width/Depth Ratio	<10, mean wetted width divided by mean depth
Streambank Stability	>80 percent stable
Lower Bank Angle	>75 percent of banks with <90° angle

Source: USFS (1995).

RHCAs are *areas within a watershed where riparian-dependent resources receive primary emphasis, and management activities are subject to specific watershed standards* (USFS 1995). Interim RHCA widths apply where watershed analysis has not been completed. Site-specific widths may be increased where necessary to achieve riparian management goals and objectives, or decreased where interim widths are not needed to attain RMOs or avoid adverse effects. Establishment of RHCAs would require a watershed analysis to provide the ecological basis for the change. However, interim RHCAs may be modified by amendment in the absence of watershed analysis where stream reach or site-specific data support the change.

The USFS has developed project- and site-specific standards and guidelines that apply to all RHCAs and to projects and activities in areas outside RHCAs that are identified through National Environmental Policy Act (NEPA) analysis as potentially degrading RHCAs. Under the strategy, the standards and guidelines would be applied to the entire geographic area of the project. Specific standards and guidelines were developed and identified for activities such as timber management, road management, and grazing management, as well as for watershed and fisheries habitat restoration. A complete list of all standards and guidelines is contained in USFS (1995).

7.2 PLUM CREEK NATIVE FISH HCP

The Plum Creek Native Fish HCP covers 1.4 million acres of Plum Creek Timber Company lands mostly in Montana, and small portions in Idaho, (Plum Creek Timber Company 2000). This HCP was developed as part of issuing an incidental take permit for certain listed species. Redband trout are not a species covered by the plan. Covered activities include:

- commercial forestry and associated activities,
- forest fire suppression,
- open-range and leased cattle grazing,
- miscellaneous forest product sales,
- conservation activities,
- special forest use permits, and
- forest products manufacturing.

Habitat goals and objectives are based on the principle that native salmonids prefer habitat that consists of cold, clean, complex, and connected waters. Therefore, the biological goals of the Plum Creek HCP include these four habitat parameters: cold, clean, complex, and connected. The following quoted material, taken from the Plum Creek HCP discusses the goals and the objectives necessary to effectively provide these four habitat parameters.

Cold

Goal: Protect stream temperatures where they are suitable for fish and contribute to restoration of temperatures where past project area management has rendered them unsuitable.

Objectives:

1. *Minimize impacts to canopy closure and changes in channel morphology resulting from riparian timber harvest and grazing.*

2. *Improve the ability of riparian vegetative communities to provide canopy closure over streams through passive and active restoration.*
3. *Create a net increase in canopy closure over streams.*

Clean

Goal: Protect instream sediment levels where they are suitable for fish and contribute to restoration of instream sediment levels where they have been impacted by past project area management.

Objectives:

1. *Minimize sediment delivery to streams resulting from the construction of new roads and timber harvesting.*
2. *Reduce sediment delivery to streams from existing roads.*
3. *Create a net reduction in sediment delivery to streams.*
4. *Contribute to restoration of the function of riparian vegetative communities for sediment filtration and stream bank stability.*

Complex

Goal: Protect instream habitat diversity where it is suitable for fish and contribute to restoration instream habitat diversity where it has been impacted by past project area management.

Objectives:

1. *Minimize impacts to large woody debris recruitment and bank stability in harvested streamside stands.*
2. *Minimize impacts to overhanging stream banks because of grazing or riparian harvest.*
3. *Improve the ability of riparian forests to provide a broad range of riparian functions to streams.*
4. *Improve the ability of riparian vegetative communities to develop overhanging banks and other habitat diversity through passive or active restoration.*
5. *Create a net increase in large woody debris recruitment potential and other riparian functions in the project area.*

Connected

Goal: Protect and contribute to restoration of connectivity among subpopulations of native fish in the project area.

Objectives:

1. *Avoid creating fish passage barriers when constructing stream crossings.*
2. *Restore fish passage where existing road stream crossings restrict passage.*
3. *Cooperate to restore fish migration where restricted by other factors such as irrigation diversions or thermal barriers.*

To achieve these habitat goals and objectives, specific BMPs were developed to address commitments of road and upland, riparian, and range management. Road and upland management BMPs address

sediment delivery reduction and slope stability associated with planning, design, construction, and maintenance of roads and skid trails. Riparian management BMPs use state riparian regulations as minimum requirements and incorporate protective measures specific to streams having channel migrations zones (CMZ), high sensitivity streams without CMZs, other perennial fish-bearing streams, headwater streams, and areas of riparian-upland interface. Commitments for grazing management primarily include grazing exclosures, effectiveness monitoring, and rancher training. In addition, the Plum Creek HCP also specifies strategies and regulations for land-use planning, monitoring, and adaptive management.

8. EXISTING DNRC MONITORING AND RESEARCH PROGRAMS

According to ARM 36.11.424, the DNRC is required to develop and maintain a monitoring strategy to assess watershed impacts of land-use activities and the effectiveness of mitigation measures. In general, such a strategy is to include qualitative assessments (such as BMP audits), site-specific quantitative assessments of selected sites, habitat assessments of streams that support listed or sensitive species, and an inventory of watershed impacts, as funding allows, to determine BMP effectiveness. Such assessments are also intended to identify causes of watershed degradations and set restoration priorities while maintaining beneficial uses. The DNRC intends to use monitoring information in an adaptive management approach to correct identified impacts resulting from forest management practices and modify applied mitigations or future activities to avoid observed impacts. In addition, DNRC is required to participate in cooperative watershed monitoring efforts with other agencies and public and private parties.

Most watershed and fisheries monitoring efforts occurring on state forest lands are either strictly qualitative assessments, such as BMP audits, or site-specific assessments associated with specific management activities or mitigation measures that impact the environment (Frank 2003, personal communication). Most assessments are done on an as-needed basis.

8.1 WATERSHED MONITORING

A water quality monitoring program adopted in 1999 by DNRC is a plan to implement the watershed-related monitoring commitments made in the State Forest Land Management Plan (SFLMP; DNRC 1999). This water quality monitoring program established under the SFLMP was integrated into ARM 36.11.424 and 36.11.448. The three goals of this program are to:

1. determine sources of watershed impairment on school trust land and developed strategies for remedial actions,

2. monitor the implementation of BMPs and other mitigation measures, and

3. investigate relationships between land-use activities and watershed integrity of aquatic systems on state land.

To accomplish Goal 1, DNRC is systematically completing watershed inventories in priority drainage basins throughout the state. Goal 2 is to be accomplished through timber sale contract inspections and BMP audits. Goal 3 is to be accomplished by implementing project-level monitoring at specific sites.

Specific details on watershed monitoring, as listed in ARM 36.11.424 and 36.11.448(5)(c), include the following:

- *Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments (EAs) and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.*
- *qualitative assessments, such as BMP audits, on most projects with a substantial amount of soil disturbance. For future applications, the department shall revise BMP's that fail to provide adequate protection;*
- *site-specific monitoring projects using quantitative assessment methods on selected sites to determine the effectiveness of BMP's and other commonly applied mitigation measures;*

- *assessments of habitat conditions on selected streams identified as supporting the fish species listed as threatened or endangered under the Endangered Species Act, 16 U.S.C. Sections 1531 through 1544, and sensitive fish species;*
- *evaluations of the effects of forest management activities on soils at selected sites; and*
- *an inventory and analysis of watershed impacts on state trust lands as funding allows.*
    - *if conducted, the analysis shall be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. The department shall emphasize mitigation of existing water quality impacts in order to provide greater opportunities to produce trust income while maintaining beneficial uses.*

o *if watershed, soil, or fisheries monitoring indicate unacceptable impacts resulting from forest management activities, the department shall attempt to verify the problem, and correct or mitigate it to an acceptable level. When necessary, the department shall use the information collected to revise mitigation measures and/or modify future activities to avoid similar problems.*

o *the department shall participate in cooperative watershed monitoring effort with other agencies, public entities and private parties, where practical, when funding is available, and when the cooperative monitoring objectives are consistent with department monitoring objectives. (History: 77-1-202, 77-1-209, 77-5-201, 77-5-204, MCA; IMP, 77-5-116, 77-5-204, 77-5-206, 77-5-207, MCA; NEW, 2003 MAR p. 397, Eff. 3/14/03.)*

8.1.1 Watershed Inventories

During watershed inventories, all roads, stream crossings, stream channels, and stream reach riparian areas are surveyed to identify existing or potential sources of erosion and sediment delivery to streams. As of fiscal year 2000, approximately 51,979 acres of school trust lands were inventoried. Inventories were conducted in the Alaska, Beaver/Bear Creek, West Clearwater, West Fork Swift Creek, Elk Creek, Lyman Creek, Lyons Creek, Praine/Andrew Creek, Whitetail Creek, Wolf Creek, and Woodward Creek drainages. During inventories, all roads, stream crossings, and stream reaches were surveyed to identify existing or potential sources of erosion and sediment delivery potential.

8.1.2 Timber Sale Contract Inspections

Timber sale contract inspections are periodically conducted while timber sales are active. Visual qualitative evaluations are conducted to determine whether practices are being correctly applied during harvest and road construction activities. There are 23 standard items evaluated. Reporting categories are satisfactory, needs improvement, and violation.

8.1.3 BMP Audits

BMP audits are conducted during or shortly after completion of DNRC timber sales. During BMP audits, practices implemented during harvest activities are rated for proper application and effectiveness in preventing impacts to soil and water resources. This monitoring effort is qualitative and requires only visual estimations of BMP applications and effectiveness, rather than measurement of habitat attributes or impacts. Therefore, evaluation of impacts is subjective. A standard BMP audit worksheet is used to aid in obtaining the following types of information:

- site information (drainage, unit size, road construction lengths, logging methods, site slope, soil erodibility);

- assessment of roads (aspects of planning, location, design, drainage, construction, and maintenance);
- timber harvest activities (harvest design, skidding operations, and slash treatments);
- stream crossings (proper permitting, design considerations, and installation impacts);
- handling of hazardous substances; and
- SMZ information (adequate SMZ maintained according to regulations, properly marked, tree retention requirements met, and the exclusion of equipment operations, road construction, deposition of road fill, side-casting of road fill, slash, and hazardous materials).

8.1.4 Project-level Monitoring

Several site-specific monitoring projects are designed by DNRC to quantitatively determine BMP effectiveness and mitigation measures at reducing non-point-source pollution. An example of project-level monitoring was conducted for the Sula State Forest Fire Mitigation Salvage Recovery Project (DNRC 2002b). Monitoring included the following assessments:

- BMP audits;
- effectiveness of SMZ buffers (LWD recruitment and retention, stream shade retention);
- soil disturbance and erosion;
- water-quality monitoring (pH, total suspended solids, soluble phosphates, total phosphates, and nitrates;
- stream temperature (continuous recording on study and reference reaches);
- stream channel geomorphology (cross-section and longitudinal);
- riparian conditions (plant species composition, abundance, and browse utilization along defined transects); and
- visual assessment of streambank erosion.

Another example of project-level monitoring was conducted for the Moose Fire Salvage and Restoration Project (DNRC 2003b). In August and September of 2001, the Coal Creek State Forest was extensively burned by the Moose Wildfire. Following this fire, DNRC assessed the fire areas, identified rehabilitation and reforestation needs, and a salvage plan was completed that incorporated such needs. A monitoring plan was designed to:

- compare soil conditions and erosion on harvested and non-harvested sites,
- assess the effectiveness of salvage harvest mitigation,
- evaluate the levels of post-fire ground vegetation canopy cover, and
- recommend future management strategies.

The fire area was assessed for burn severity, soil conditions, coarse woody debris, fine woody debris, vegetative cover, erosion (using sediment fencing and erosion traps), and soil density.

Similar project-level monitoring efforts were conducted for the following activities and sites (DNRC 2000):

- Quiet Stems Timber Sale,
- Blanchard Creek Stream/Riparian Restoration,
- Little Thompson River Grazing Management,
- Praine Creek/Andrews Creek Riparian Restoration,
- Swan State Forest Water Quality Monitoring,
- Stillwater State Forest Water Quality Monitoring, and

- reference reach monitoring (control sites established on certain streams for the collection of channel morphology, LWD, riparian conditions, macroinvertebrate assessments, and water temperatures).

8.2 FISHERIES MONITORING

The distribution of redband trout in Montana is limited to the Kootenai River drainage. Past and current fisheries monitoring efforts have primarily focused on westslope cutthroat trout and bull trout outside of the Kootenai River drainage. Currently, DNRC does not conduct fisheries monitoring of redband trout populations. However, watershed monitoring efforts as described in Section 8.1 and monitoring practices directed towards westslope cutthroat trout and bull trout as described below would be applicable to the monitoring of redband trout populations if conducted in the Kootenai River drainage.

A portion of fisheries habitat monitoring is conducted in a manner similar to the watershed monitoring efforts described above, where timber sale contract administration is a form of project monitoring. As part of ARM 36.111.424(3) and 36.11.427, DNRC also participates in cooperative monitoring and fisheries conservation efforts such as the Flathead Basin Monitoring Program, the Montana Cutthroat Trout Steering and Technical Committees, and the Montana Bull Trout Restoration Team. On the Swan, Stillwater, and Coal Creek State Forests within the Flathead River basin, watershed conditions (according to watershed monitoring methods described above) and fisheries habitat were evaluated over several years with emphasis on westslope cutthroat trout and bull trout habitat. Similar monitoring efforts were extended to the Southwestern and Central Land Offices.

8.2.1 Fish Passage Assessment Project

DNRC has initiated a complete and detailed inventory of all road stream-crossing structures occurring on DNRC administered lands with streams that support populations of native salmonids. During these inventories all information necessary to model and evaluate fish passage at a particular site is collected, such as detailed measurements of the crossing structures and surveys of the stream channel. The DNRC fish passage assessment project is scheduled for completion in early 2006.

8.2.2 Swan River, Stillwater, and Coal Creek State Forests

The following habitat attributes are monitored by MFWP under contract with DNRC:

- substrate scores (particle size and percent embeddedness),
- streambed core samples (actual measurement of substrate particle sizes),
- westslope cutthroat trout and bull trout redd counts, and
- fish species composition.

8.2.3 Southwestern and Central Land Offices

The following habitat attributes are monitored:

- fish species presence/absence,
- fish population surveys,
- westslope cutthroat trout genetic sampling,

- fish habitat surveys according to Level II protocols of the R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook (Overton et al. 1997), and
- macroinvertebrate sampling according to Rapid Bioassessment Protocols (Bukantis 1998).

Data collected specifically on forested state trust lands is associated with project level monitoring and fisheries monitoring efforts as described above. Other fisheries research and monitoring efforts are currently being developed as part of a long-term fisheries program (Bower 2003 personal communication).

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